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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Naoki Chiba

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09/09/2004

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EXAMINER

ROSARIO-VASQUEZ, DENNIS

ART UNIT

PAPER NUMBER

2621

DATE MAILED: 09/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/988,630	CHIBA, NAOKI	
	<b>Examiner</b>	<b>Art Unit</b>	
	Dennis Rosario-Vasquez	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 11/20/2001.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 November 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Drawings***

2. The drawings are objected to because figure 5 has a misspelled label of "filld result" which ought to be amended to "filled result". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

3. The disclosure is objected to because of the following informalities:

Page 16, line 10: "construcgng" ought to be amended to "constructing".

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Altunbasak et al. (US Patent 6,597,816 B1).

Regarding claim 1, Altunbasak et al. discloses in a lens distortion factor calculating apparatus and method for subjecting an image picked up by image pick-up means having a lens to lens distortion correction, the lens distortion factor calculating apparatus comprises:

a) first means (Equations 33 and 34 in column 11 which is illustrated in fig. 2) for finding, on the basis of two images (fig. 2, numerals 210 and 230) picked up by the image pick-up means (fig. 1, num. 110 is an image capture device in col. 2, line 39.), the coordinates (A point in image 210 is in the upper left corner and a point in image 230 is in the lower right corner.) of a plurality of corresponding points (The points in images 210 and 230 is the same point but moved from image 210 to image 230 as mentioned in col. 11, lines 40-46.) between the images (fig. 2, numerals 210 and 230);

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b) second means (Affine motion model in col. 12, lines 62-64 is applied to equations 33 and 34 as mentioned from col. 12, line 62 to col. 13, line 25.) for calculating, on the basis of the coordinates (A point in image 210 is in the upper left corner and a point in image 230 is in the lower right corner.) of the corresponding points (The points in images 210 and 230 is the same point but moved from image 210 to image 230 as mentioned in col. 11, lines 40-46.) found by the first means (Equations 33 and 34 in column 11 which is illustrated in fig. 2), geometric transform factors  $((x_g, y_g)$  and  $(x, y)$  are geometric transform factors:  $(x_g, y_g)$  is a distorted pixel position in the image of figures 220 and 240 that correspond with images of 210 and 230, respectively, and  $(x, y)$  is the corrected pixel position that corresponds with the images of fig. 210 and 230 and mentioned col. 11, lines 40-45 and 65-67.) between said two images (fig. 2, numerals 210 and 230); and

c) third means (equation 42:  $\Psi$  is derived from the first and second means.) for calculating, on the basis of coordinates (A point in image 210 is in the upper left corner and a point in image 230 is in the lower right corner.) of the corresponding points (The points in images 210 and 230 is the same point but moved from image 210 to image 230 as mentioned in col. 11, lines 40-46.) found by the first means (Equations 33 and 34 in column 11 which is illustrated in fig. 2) and the geometric transform factors  $((x_g, y_g)$  and  $(x, y))$  found by the second means (Affine motion model in col. 12, lines 62-64), a lens distortion factor ( $K_7$  is the claimed lens distortion factor; the equation of " $\Psi$ " is a function of lens-distortion  $K_7$  in col. 11, line 65 and col. 13, lines 34,35.)

Regarding claim 2, Altunbasak et al. discloses the lens distortion factor calculating apparatus according to claim 1, characterized in that the first means comprises:

a) means ("motion estimation" models from col. 1, line 67 to col. 2, line 3.) for extracting ("recognized" in col. 2, line 1) an overlapped portion ("successive overlapping images" in col. 1, lines 64,65) of the two images (fig. 2, numerals 210 and 230 are successive overlapping images.) picked up by the image pick-up means (fig. 1, num. 110 is an image capture device in col. 2, line 39.),

b) means for extracting, from the overlapped portion ("successive overlapping images" in col. 1, lines 64,65) of one of the images (fig. 2, num. 210) with the other image (fig. 2, num. 230), a plurality of partial images ("small rectangular regions" in col. 13, line 43) effective for tracking (Using optical flow a trajectory of a pixel is followed as mentioned in col. 2, lines 52,53. The small rectangular regions correspond to  $x_g$ , which is a "OFE [optical flow equation]...equation" as mentioned in col. 11, lines 54-64.) by an optical flow (Section: "Optical flow" in col. 2, line 51 has an OFE equation 10 located in column 4.) between both the images (Fig. 2, numerals 210 and 230 which correspond to equation 10 with two images  $I_1$  and  $I_2$ .) as feature points (rectangular "regions with features" as mentioned in col. 13, lines 41-47), and

c) means for tracking a point (A "motion vector" is used for each pixel in col. 2, lines 22-26 and col. 5, lines 10,11.), which corresponds (The motion vector is used for mapping pixels from one frame to another in col. 12, lines 62-63. Note that a motion vector is generated in an affine motion model which represents a vector as a set of parameters and pixel location as mentioned in col. 5, lines 13-15 and col. 6, lines 48,49.) to each of the feature points (The affine motion model is used with the rectangular "regions with features" as mentioned in col. 13, lines 41-53.) on the one image (fig. 2, num. 210), on the other image (fig. 2, num. 230) on the basis of the optical flow (The affine motion model represents a motion vector is based on optical flow equation. The equation at the bottom of column 6 is based on equation 9 in column 3 which is an optical flow equation described in the section of "Optical flow" from col. 2, line 51 to col. 4, line 67.) between both the images (Equations 38 and 39 in column 13 is a mapping from one frame to another frame as mentioned in col. 13, lines 19,20 Additionally, fig. 2 shows the mapping from one frame to another.).

Claim 3 was addressed in claim 1.

Claims 4,6,8,10 and 12 were addressed in claim 2.

Claim 5 is similar to claim 1 except for the limitation of a computer readable recording medium (fig. 1, num. 130) having a lens distortion factor calculation program (fig. 1, num. 130 has "instructions" in col. 2, lines 40,41.) which is disclosed by Altunbasak et al.

Claim 7 is similar to claim 1 except for the additional limitations of a means and method:

d) fourth means ("Linearization in Geometric Correction" in col. 14, line 1 and shown in fig. 3, numerals 330-350.) for subjecting the first image (fig. 2, num. 210) and the second image (fig. 2, num. 230) to lens distortion correction (The step in fig. 3, numerals 330-350 determines  $K_7$  as the lens distortion factor as mentioned in col. 14, lines 36,37 that is used in equations 38 and 39 where  $x'$  and  $y'$  are corrected pixel positions as mentioned in col. 11, lines 66,67.) on the basis of the lens distortion factor ( $K_7$  is the claimed lens distortion factor; the equation of " $\Psi$ " is a function of lens-distortion  $K_7$  in col. 11, line 65 and col. 13, lines 34,35.) calculated by the third means (equation 42:  $\Psi$  calculates initial values in fig. 3 step 320 which are used by steps 330-350 as mentioned in col. 13, lines 50-53.); and



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e) fifth means for combining the first image (fig. 2, num. 210) and the second image (fig. 2, num. 230), which have been subjected to the lens distortion correction (The step in fig. 3, numerals 330-350 determines  $K_7$  as the lens distortion factor as mentioned in col. 14, lines 36,37 that is used in equations 38 and 39 where  $x'$  and  $y'$  are corrected pixel positions as mentioned in col. 11, lines 66,67.), obtained by the fourth means ("Linearization in Geometric Correction" in col. 14, line 1 and shown in fig. 3, numerals 330-350 uses  $(x_g, y_g)$  and  $(x, y)$  for computing parameters as mentioned in col. 11, line 57-65 for fig. 3, num. 320.) using the geometric transform factors  $((x_g, y_g)$  and  $(x, y)$  are geometric transform factors:  $(x_g, y_g)$  is a distorted pixel position in the image of figures 220 and 240 that correspond with images of 210 and 230, respectively, and  $(x, y)$  is the corrected pixel position that corresponds with the images of fig. 210 and 230 and mentioned col. 11, lines 40-45 and 65-67.) between the first image (fig. 2, num. 210) and the second image (fig. 2, num. 230) which have been subjected to the lens distortion correction (The step in fig. 3, numerals 330-350 determines  $K_7$  as the lens distortion factor as mentioned in col. 14, lines 36,37 that is used in equations 38 and 39 where  $x'$  and  $y'$  are corrected pixel positions as mentioned in col. 11, lines 66,67.).

Claim 9 was addressed in claim 7.

Claim 11 was addressed in claims 5 and 7.

**Conclusion**

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.


Szeliski et al. (US Patent 6,157,747 A) is pertinent as teaching a method of using optical flow with overlapping images to prevent lens distortion as mentioned from col. 3, line 66 to col. 4, line 7.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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